EMULEX QFS10™
SCSI Host Adapter
Installation and Maintenance Manual

EMULEX

QS1050501–00, Rev A
October 2, 1992

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About This Manual

This manual describes the installation and operation of the Emulex QFS10™, Q-bus to SCSI host adapter. To prevent possible damage to the adapter or host system, installation should be performed by qualified field service personnel only.

This manual contains the following sections:

- **Section 1, Introduction** – describes the QFS10 and gives ordering information, features, and specifications.
- **Section 2, Installation and Configuration Planning** – discusses the possible subsystem configurations.
- **Section 3, Hardware Installation** – provides the procedures required to configure the QFS10 host adapter and install it in the host. These procedures include setting jumpers and DIP switches, physically installing QFS10 in the host cabinet, connecting cables, and running the self-test.
- **Section 4, Loading and Starting the Firmware Resident Utilities** – provides procedures for loading the Firmware Resident Utilities into system memory, and invoking the utilities from system console commands or the Emulex online FRU application program.
- **Section 5, Firmware Resident Utilities Operation** – provides procedures for using the FRU to configure the QFS10 and connected SCSI devices.
- **Appendix A, SCSI Interface** – describes the SCSI protocol and interface as it is implemented in the QFS10 host adapter.
- **Appendix B, PROM Removal and Replacement** – provides instructions for upgrading the QFS10 host adapter by removing and replacing the firmware.

The manual concludes with a glossary of terms, and an index.

After reading this manual, please take a few moments to fill out and return the Reader's Comment card. Your comments will help us maintain the level of excellence you have come to expect from Emulex products.

Audience

This manual is intended for the following audiences:

- Field service engineers who are responsible for installing and maintaining the host system, peripherals, and subsystems
- System managers who are responsible for configuring the system and its peripherals

Product Support

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For assistance in the continental United States, Alaska, and Hawaii, contact Emulex:

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  Outside California: (800) 854–7112
  FAX: (714) 966–1299
- Ordering Information
  California: (714) 662–5600
  Outside California: (800) 854–7112
  FAX: (714) 241–0792, Attention: Order Administration
  TLX: 183627, Attention: Order Administration

Conventions Used

- Screen displays and user entries are shown in a monospaced font. For example:

```
Adaptive DMA = Y
Delay between DMA bursts = 2
DMA transfers between checks for DMA request = 8
```

- Variable names and items of importance are shown in *italics*.

Related Documentation

For further information on the Emulex utilities used by the QFS10, refer to the following:

Emulex MSCP Reference Manual Rev. 3.0

Emulex Interactive SCSI Exerciser (ISE) Users Guide, P/N HA9950903–00

For information on DEC's Q-bus or disk controllers, refer to:

Digital Equipment UDA50 Programmers Kit, P/N QP–905–GZ

DEC Q-bus Specification

For a detailed description of the SCSI interface and signal protocol, refer to the *ANSI SCSI 2 Specification*, X3.131–199X 9/1/91.

Section 1
INTRODUCTION

1.1 General Description

The QFS10 host adapter is a Q-bus board that interfaces the DEC MicroVAX II (and above) and PDP-11 families to the 8-bit wide, 10 megabyte per second SCSI-2 bus. The QFS10 is the first in a family of boards that brings new levels of performance and functionality to these families of processors by allowing them to interface to new high performance SCSI disk, tape and other peripherals. The QFS10 supports caching up to 4 Mbytes.

The QFS10 functions as an MSCP and TMSCP server to the operating system on the host. It simultaneously emulates the UDA-50 disk controller with RA8X disks, and the TU81 tape controller. Unlike other host adapters on the market, the QFS10 optionally supports a separate CSR address for each SCSI device attached.

A separate CSR address may be used as a special communications channel between application programs running on the host for control of robotic mechanisms in tape and disk handlers. This channel is also used to provide direct access to the Firmware Resident Utilities for on-line formatting and testing, and for monitoring the progress of tape operations performed during backup or restore operations.

By combining our advanced FAST SCSI-2 chip with a high bandwidth DMA controller and custom VLSI, multi-address Q-bus host adapter/controller, both the MSCP (mass storage control protocol) and TMSCP (tape mass storage control protocol) are supported simultaneously with low bus overhead on both the Q-bus and SCSI bus. Nonvolatile memory (NOVRAM) stores up to 8 addresses for either MSCP or TMSCP servers.

Both fast SCSI and standard SCSI devices may be mixed on the SCSI bus. Optionally, the SCSI bus of two or more QFS10 host adapters can be connected to the same SCSI cable to form a single SCSI bus with shared peripherals.

The host adapter is produced in two configurations; a dual-wide board for LSI-11 and MicroVAX II hosts, and a quad-wide board with mechanical handles to fit the MicroVAX III and VAX4000 family hosts.

1.2 Features

The features of the QFS10 include the following:

- **Microprocessor Design:** A 32-bit microprocessor handles all functions resulting in fewer components, high reliability, and easy maintainability without expensive, dedicated hardware.
- **Cache:** Higher data throughput is realized by using a write-through cache.
- **Concurrent MSCP and TMSCP Emulations:** Up to 7 mixed tape and disk peripherals are supported simultaneously.
- **Improved Throughput:** Custom-designed buffer and host adapter controller chips perform DMA transfers on the host bus in excess of 3 Mbytes per second with a peak rate of 550 nanoseconds per word.
- **SCSI Bus:** Data rates of up to 10 Mbytes per second in FAST SCSI mode are supported. Asynchronous and synchronous modes are supported for seven SCSI devices on a single SCSI bus.
- **Multi-Host Support:** Multiple host configurations are supported by the QFS10. Failover is not supported. Instead, the QFS10 recovers from SCSI bus resets caused by other devices by retrying the last command received prior to detecting the reset.
- **Firmware Resident Utilities:** The host adapter firmware incorporates the Firmware Resident Utilities and a diagnostic interface. The utilities configure the host adapter NOVRAM with operating parameters for the host adapter and its attached peripheral devices.
- **Built-in Self-Test:** Proper operation is verified on power-up. For further analysis, failures are reported by four LEDs and an error code in the Status and Address (SA) register.
- **Adaptive DMA:** This feature ensures that CPU functions, including interrupt servicing, are not locked out for excessive periods of time by high-speed disk or tape transfers.
- **Block-Mode DMA:** When Block-Mode DMA is enabled, the overhead associated with DMA operations is reduced.
- **Transparent Operation:** This feature is engineered for transparent operation with all current and future SCSI peripheral drives, utilizing DEC's standard device drivers.
- **22-Bit Addressing:** This feature supports the 22-bit addressing capability of the extended Q-bus.
- **Command Queuing:** Buffers can store over 50 MSCP commands.
- **Bad Block Replacement:** Both controller and host initiated replacement are supported. Selection is stored in the NOVRAM for later change.
- **Forced Error Flagging:** This feature is supported for each drive, using redundant tables on the disk. Up to 126 flagged sectors per drive are currently supported.

- **Exclusive Console Tape Monitor:** This monitor indicates amount of tape used/remaining, error summary, and compression ratio of selected tape drives.
- Additional features include:
  - ☐ SCSI-2 disconnect/reconnect.
  - ☐ Two modes of SCSI "Backdoor" commands, the original UCXX compatible mode and a new method that is transparent to the operating system driver
  - ☐ Active SCSI bus termination
  - ☐ Fast file search for 8-mm Exabyte and 4-mm DAT drives
  - ☐ User selectable auto configure for all SCSI peripherals attached
  - ☐ Online formatting and diagnostic of selected SCSI peripherals

1.3 Models and Accessories

QFS10 models are shipped with some or all of the following:

- Emulex host adapter (QFS10, QFS10-III)
- Transition panel with cable

The QFS10 and the QFS10-III are functionally identical and differ only in their physical layout:

- The QFS10 is designed for use with MicroVAX II and LSI-11 bus host systems.
- The QFS10-III incorporates a shielded front panel specifically designed for use in MicroVAX III and VAX4000 installations.
- Cache memory is specified in the part number as follows:

Table 1–1. Cache Memory P/N

QFS10	**QFS10-III**
QS1010201–02 (512 Kbyte)	QS1010202–02 (512 Kbyte)
QS1010201–04 (1 Mbyte)	QS1010202–04 (1 Mbyte)
QS1010201–06 (2 Mbyte)	QS1010202–06 (2 Mbyte)
QS1010201–08 (4 Mbyte)	QS1010202–08 (4 Mbyte)

Unless specified, references in this manual to the QFS10 apply to both models.

Table 1–2 lists the accessories that are included with the QFS10.

Table 1–2. QFS10 Accessories

Option	**Description**
QS1010501	QFS10 Manual
QS1062001	Tape, FRU Application (VMS)
ER2010205	Female RJ12 to RS232 Adaptor
5300003	RJ12 MOD Line 25 Foot Cable
QT1311201–00	Local RS-232 CRT Cable

Table 1–3 lists the accessories that can be ordered to tailor your host adapter to your application.

Table 1–3. QFS10 Options

Option	Description
QS1010404–00	QFS10 SCSI Passthrough Board

For ordering information, contact Emulex Order Administration as follows:

Emulex Corporation
3545 Harbor Boulevard
Costa Mesa, CA 92626

California Telephone: (714) 662–5600
Outside of California: (800) 854–7112
TLX: 183627 Attention: Order Administration
FAX: (714) 241–7112 Attention: Order Administration

1.4 Physical Organization Overview

The QFS10 host adapters are installed in the system cabinet of Q-bus host systems, including the MicroVAX II, MicroVAX III, VAX4000, and the LSI-11. The QFS10 enables the host to communicate with SCSI peripherals in the CPU cabinet or in a separate expansion cabinet. Several cabling arrangements are possible depending on the host system.

Aggregate data storage capacities are limited only by the capacities of the peripherals. Currently, disk drives are available that can be combined to provide several gigabytes of online storage with high-speed backup capability.

The host adapter can be installed in either a single- or multi-host configuration. In a single-host installation, the host adapter can connect a maximum of seven peripherals to a host through the SCSI bus. In a multi-host configuration, two or more host adapters can connect to a maximum of six SCSI peripherals. The maximum number of SCSI devices including the QFS10 cannot exceed eight.

Figure 1-1 shows a typical SCSI subsystem with a single host and seven SCSI peripherals. Figure 1-2 shows a SCSI subsystem in a multi-host configuration where both hosts share six peripherals stored in an expansion cabinet.

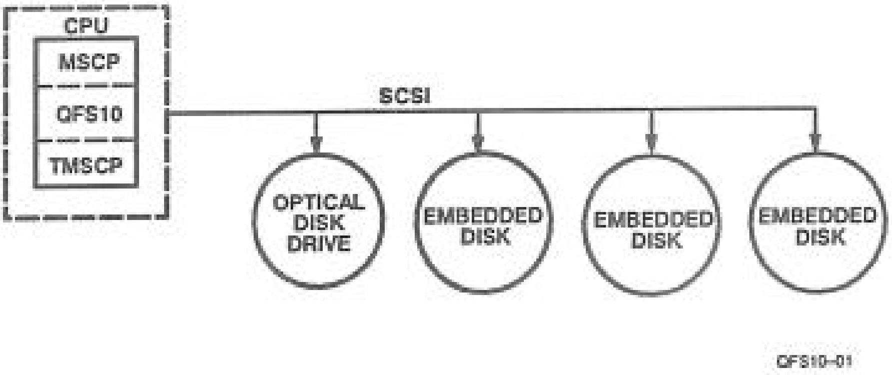


Figure 1–1. Single Host Typical SCSI Subsystem

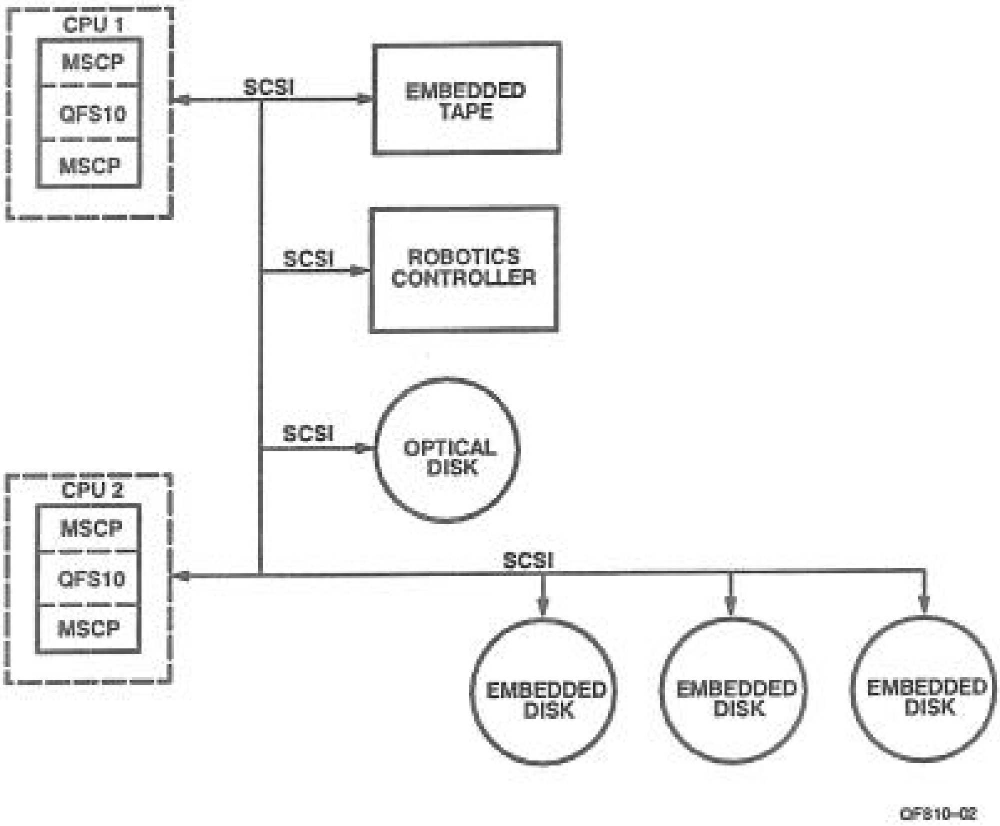


Figure 1–2. Multiple Host SCSI Subsystem

1.5 Compatibility

This subsection describes compatibility of the QFS10 with respect to SCSI devices, host systems, MSCP/TMSCP, and operating systems.

1.5.1 SCSI and Peripheral Device Compatibility

The Emulex QFS10 conforms to the ANSI SCSI-2 specification for electrical interface and protocol.

In designing the host adapter, Emulex has made every effort to maintain compatibility with the SCSI Interface. Because of the flexibility of the SCSI Interface Specification and the variety of manufacturers producing "SCSI" disk and tape controllers, we cannot guarantee proper operation with a particular SCSI disk or tape controller not included on our supported devices list. For example, in order to boot the operating system, Exabyte subsystems must have the FRU autoconfiguration utility disabled.

1.5.2 Host System Options

The QFS10 provides SCSI capability on the following DEC host systems:

- MicroVAX II
- MicroVAX 3500/3600, 3800/3900
- MicroVAX 3300/3400
- VAX 4000
- LSI-11

1.5.3 Operating System Compatibility

The host adapter is compatible with the following operating systems:

- VMS version 5.1 and later
- Ultrix-32 version 3.0 and later
- RT-11
- RSTS version 9.6
- RSX–11M-Plus version 3.0 and later

1.5.4 Diagnostic Utilities

The Firmware Resident Utilities (FRU) provided with the QFS10 allow the user to select and perform diagnostics on SCSI devices with no interference to normal system operation.

1.5.5 Software Compatibility

The QFS10 host adapter is compatible with the following:

- Standard DU and MU device drivers used with the specified operating systems
- DEC's MDM diagnostic monitor, version 3.0 (disk diagnostics only)

1.5.6 Disk Format on SCSI Drive

The following diagram shows the placement of data on a disk device. It also indicates the length and placement of special areas used by the controller and host operating system.

Host Area	RCT	Diagnostic Area	SDB	RCB	FET	FCT

- The Host Area contains all of the blocks available for host data storage.
- The RCT (DEC's replacement and caching table) is used when the controller is configured for host initiated bad block replacement.
- The Diagnostic Area (40 blocks) is used by the utilities for testing the disk drive.
- The SDB (Statistical Data Block) contains statistical data for the QFS10 that must be preserved during power down. During controller initialization, a working copy is read into RAM. Periodically, the updated working copy is rewritten to disk.
- RCB (Replacement Cache Blocks) is used during the replace block operation to temporarily hold the host data while a disk block is being reassigned. The RCB, consisting of four blocks, is used when the controller is configured for controller initiated bad block replacement.
- The FET (Forced Error Table) is used to maintain a list of blocks that have the forced error FLAG SET. Four copies of the single block FET are kept in this area of the disk.
- The FCT (Factory Caching Table) contains miscellaneous data about the disk including the volume serial number, pointers to other areas of the disk, and checkpoint/restart information for the replace block operation. Four copies of the single block FCT are kept at the very end of the disk.

1.6 Peripherals Supported

The following devices are currently supported by the QFS10. Any special OEM requirements will supercede this list in priority.

1.6.1 Disk Drives

- DEC 5.25- and 3.5-inch series
- Fujitsu 5.25-inch M2263, M2266
- Hitachi 5.25-inch DK 516C
- Maxtor 5.25- and 3.5-inch series
- Micropolis 5.25- and 3.5-inch series
- Seagate Elite series
- Seagate Wren 3, 5, 7, 8, 9 series

1.6.2 Tape Drives

- Archive 4-mm
- Cipher 995
- Exabyte 8200 and 8500 series
- Hewlett Packard 35480
- Fujitsu M1016B

1.6.3 Optical Drives

- CD ROM
- Sony magneto optical SMO–C501

1.6.4 Robotic Devices

- ADIC Tape Loader
- Hewlett Packard Jukebox

1.7 Specifications

Tables 1–4 and 1–5 provide the general and functional specifications for the host adapter. These specifications are applicable for the QFS10 and QFS10-III versions.

Table 1–4. QFS10 General Specifications

Parameter	Range/Description
Environmental	
Temperature	Maximum temperature reduced 1.8°C per 1,000 meters (1°F per 1,000 feet) altitude
Operating	32 to 104°F (0° to 40°C)
Storage	–40° to 120°F (–40° to 66°C)
Relative Humidity	10% to 95%, noncondensing maximum wet bulb of 82°F (28°C) minimum dewpoint of 3.6°F (2°C)
Cooling	6 cubic feet per minute
Heat Dissipation	25 BTU per hour
Physical	
Packaging	Single dual-wide six layer PCBA for the QFS10 Single, quad-wide, six-layer PCBA for the QFS10-III
Dimensions	5.19 x 8.6 inches (13.18 x 22.1 centimeters) QFS10 10.4 x 8.7 inches (26.4 x 22.1 centimeters) QFS10-III
Shipping Weight	3 pounds (1.4 kg)
Electrical	
Power	+5 VDC ± 5%, 1.5 A maximum
Bus Loading	AC bus loads: 2.5 maximum DC bus loads: 1 maximum
SCSI Bus Termination	Jumper-selectable, 4.25 VDC to 5.25 VDC, diode-isolated and current-limited at 1.0 A The QFS10 and QFS10-III both incorporate an active current source termination system.
Connections	
QFS10 (dual-wide)	Q-bus "fingers" SCSI-2: 50-pin male ribbon connector (male, 0.1") RS-232 port: 3-pin
QFS10-III	Q-bus "fingers" SCSI-2: 50-pin miniature (Honda) ribbon connector RS-232 port: 3-pin
Agency Compliance	FCC – Class A computing device UL CSA VDE – Safety

Table 1–5. QFS10 Functional Specifications

Parameter	Range/Description
CPU I/O Technique	Direct Memory Access (DMA), including adaptive techniques and block mode memory support
Firmware Utility Access Path	Standard console terminal, GPX monitor workstation, serial port, and FRU host application (online)
Peripheral Interface	SCSI 5-Mbyte sync/fast SCSI 10-Mbyte synchronous
Driver Option	single-ended
Maximum Length	19.5 ft (6 meters)
Output Current	48 mA (sink)
Termination (current source)	Jumper selectable active terminator
Number of SCSI peripherals	7 (mixed disk, tape, optical, robotic)
Physical CPU Interface	Q-bus Interface
Disk Q-bus Base Address selectable via FRU (programmable)	17772150_8 17760370_8 17760334_8 17760374_8 17760340_8 17760400_8 17760344_8 17760404_8 17760350_8 17760410_8 17760354_8 17760414_8 17760360_8 17760420_8 17760364_8
Tape Q-bus Base Address selectable via MDM FRU (programmable)	17774500_8 17760510_8 17760404_8 17760514_8 17760410_8 17760520_8 17760414_8 17760524_8 17760444_8 17760530_8 17760450_8 17760534_8 17760454_8 17760540_8 17760504_8 17760544_8
SCSI ID Address	0–7
Priority Level	BR4 or BR5 (jumper-selectable)
Logical CPU Interface	Emulates DEC's Mass Storage Control Protocol (MSCP) and Tape Mass Storage Control Protocol (TMSCP)
Diagnostics	MicroVAX Diagnostic Monitor (MDM) Version 3.0 and above
Operating Systems Supported	VMS – V5.1 and above Ultrix-32m – V3.0 and above RSX11M-Plus RSTS

1.8 QFS10 Command Summary List

Tables 1–6 through 1–9 summarize the commands that are supported for MSCP, TMSCP, SCSI disk and SCSI tape.

Table 1–6. MSCP Commands

Command Name	OP Code
Abort	0x01
Access	0x10
Available	0x08
Compare Host Data	0x20
Determine access paths	0x0b
Erase	0x12
Get command status	0x02
Get unit status	0x03
Online	0x09
Read	0x21
Replace logical block	0x14
Set controller characteristics	0x04
Set unit characteristics	0x0a
Write	0x22
Emulex SCSI pass through	0x58

Section 2
INSTALLATION AND CONFIGURATION PLANNING

2.1 Overview

The QFS10 is a high-speed, intelligent host adapter that allows you to interface a wide variety of SCSI devices to the DEC Q-bus. The SCSI bus provides a high degree of configuration flexibility not normally available with device controllers using dedicated peripheral buses. This section discusses some of the performance issues and other factors that must be taken into account when configuring your subsystem.

For information on adjusting or configuring your operating system for use with QFS10-based subsystem, consult your operating system documentation.

NOTE: Due to performance considerations, the low-level format required by the QFS10 will not be compatible with any previous Emulex host adapters. This means you *must reformat* your disk with the QFS10 prior to using it on-line.

Connection to the QFS10 is via a high-density (Honda style) connector. This connector is mounted on a transition panel that is supplied by Emulex.

2.2 QFS10, and QFS10-III Configurations

NOTE: A SCSI device can be either an Initiator or a Target. An Initiator is a SCSI device that requests an operation to be performed by another SCSI device. A Target is a SCSI device that performs an operation requested by an Initiator. On the SCSI bus, the QFS10 always acts as an Initiator.

All references to the QFS10 Intelligent Host Adapter also apply to the QFS10-III; references to the QFS10-III apply only to the QFS10-III. The possible configurations for both models are as follows:

- **Single Initiator, single Target, single host adapter.**

  This is the most basic use of the QFS10. The QFS10 can function as both an MSCP and TMSCP controller. When performing an MSCP emulation, the attached Target device can be either a magnetic or optical disk device.

- **Single Initiator, multi-Target, single host adapter.**

  In this configuration, the QFS10 Initiator can be in MSCP and/or TMSCP mode. Special software might be required when using this configuration with a mixture of optical WORM and magnetic drives on the same MSCP emulation. In general, there are no restrictions to mixing 4-mm, 8-mm, or other SCSI tape and disk devices on the same SCSI port.

- **Multi-Initiator, single or multi-Target, multi-CPU.**

  This configuration can be used in applications that require multiple CPU access to a set of peripherals that are shared among two or more CPUs. By programming the NOVRAM on each host adapter, the user can determine which of the attached drives can be accessed by any CPU. This configuration requires special care to prevent dynamic multi-access, unless special software is used to perform Lock Management Functions.

  The current version of QFS10 firmware does not support the SCSI Reserve and Release functions. It, therefore, cannot function as a dual-ported disk in applications that require the disk to be on-line to only one CPU at a time (to provide proper Lock Management Functions). Such applications include LAVC or other non-HSC-based cluster configurations.

  It is still possible for each CPU to simultaneously mount and access different tape drives on the same SCSI bus because multi-CPUs share a common set of multiple tape drives; however, Emulex recommends that each tape device be logically mounted by only one CPU at a time.

- **Other Complex Configurations.**

  Figure 2–1 illustrates a complex multi-CPU, multi-host adapter configuration, which demonstrates the high degree of system configuration flexibility that the QFS10 Host Adapter provides. This configuration requires special lock management software to control multiuser dynamic access to the shared peripherals.

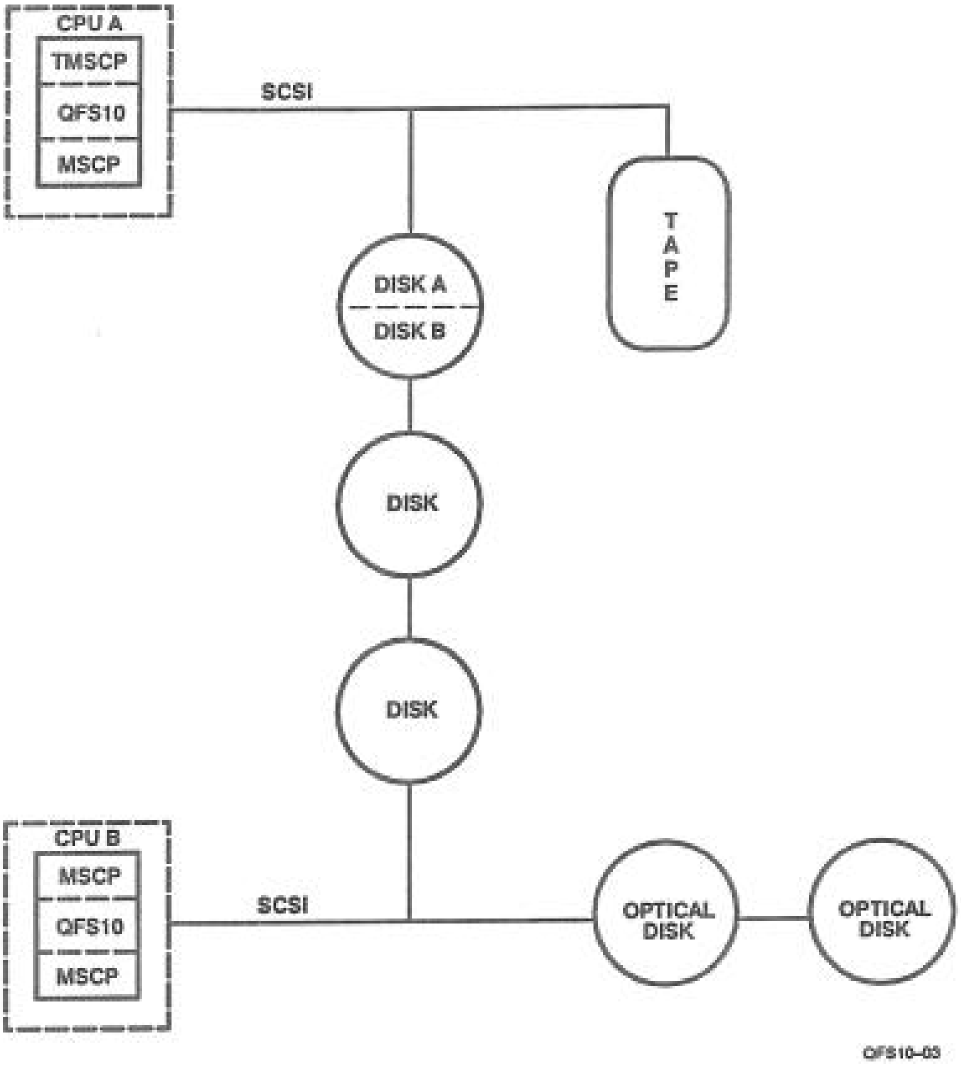


Figure 2–1. Complex QFS10 Configuration

2.3 Performance Considerations

The main advantage offered by the QFS10 is configuration flexibility. In addition, SCSI's ability to interleave DMA operations in multi-drive, multi-tasking applications will provide better performance than a similarly configured ESDI subsystem. This subsection discusses the performance considerations for several peripheral devices.

2.3.1 Disk Subsystems

The QFS10 Host Adapter uses the Emulex FAS–216 chip to provide an extremely high-speed logical connector to the SCSI bus. In addition, the QFS10 supports (SCSI-2) fast SCSI data transfers. Coupled with disk drives that are SCSI-2 compliant, transfer rates may reach 10 Mbyte/second.

2.3.2 Tape Subsystems

The QFS10 can be used with a wide variety of SCSI-based tape drives. The main differences between drive types are in capacity and performance.

2.3.2.1 Cartridge Tape Drives, 8-mm and 4-mm

The QFS10 can be used with a wide variety of 8-mm Exabyte and 4-mm DAT tape drives to emulate a DEC TU81 subsystem. The QFS10 and Exabyte combination offers the user a highly reliable, extremely high-capacity tape subsystem. However, this combination does perform differently than a SCSI-based, 1/2-inch reel-to-reel tape subsystem. In general, the following differences should be expected:

- If the cartridge drive supports data compression when running under VMS, the density switch may be used as follows:

  `/density=6250` enables compression
  `/density=1600` disables compression
  `/density=800` enables 8200 emulation on an Exabyte 8500 drive

- The transfer rate of the QFS10-to-Exabyte is lower than that available with a 50 IPS or faster GCR tape subsystem. Multi-reel backup applications however, require operator intervention to change tapes. The actual backup time, therefore, will be similar to that for the QFS10-to-Exabyte subsystem.
- Any operations that utilize large amounts of tape positioning and directional changes will be considerably slower on the QFS10-to-Exabyte tape subsystem. This means that logical operations such as mounting, initializing, etc., take longer than similar operations on traditional tape subsystems. The 4-mm DAT will offer some improvement over 8-mm, but will not be as fast as 1/2-inch cartridge or reel-to-reel drives.

- Emulex strongly recommends that the 8- and 4-mm-based tape subsystems be used primarily with utilities that require a minimum of tape positioning such as VMS Backup, RSX-11M BRU, RSTS Backup, or RT11 BUP. Other utilities such as COPY, PIP, and FLX should be used only as absolutely necessary.

Section 3
HARDWARE INSTALLATION

3.1 Overview

This section describes installation of the QFS10 and cable connections to the SCSI subsystem. Two different models are designed for different host systems, as follows:

- QFS10 for MicroVAX II and LSI-11 host systems
- QFS10-III for MicroVAX III and VAX 4000 host systems

Inspection and configuration is the same for both models; only the installation procedures differ. The QFS10 refers to procedures applicable to both models. Procedures specific to a particular model reference that model (QFS10, QFS10-III).

WARNING!! Observe proper antistatic grounding procedures. Be sure to use a grounding wrist strap when handling the QFS10. Remove power from the equipment before removing covers to avoid personal injury and damage to the equipment.

3.2 Maintaining FCC Class A Compliance

Emulex has tested the QFS10 with DEC computers that comply with FCC Class A limits for radiated and conducted interference. When properly installed, the host adapters do not cause compliant computers to exceed Class A limits. To limit radiated interference, DEC completely encloses the components of its computers that generate or could conduct radio-frequency interferences (RFI) with a grounded metal shield (earth ground). With the host adapter properly installed, there is no reduction in the effectiveness of this shield.

3.3 Installation Checklist

The following checklist summarizes the process of installing the QFS10 (QFS10-III) host adapter. Each step in the checklist references the appropriate subsection(s) of this manual that contains the required procedure. Use the checklist as a guide, following each step in sequence to configure and install your host adapter and cabling.

NOTE: To avoid errors, you should read through the subsections that pertain to your host adapter *before* you begin the installation.

HOST ADAPTER INSTALLATION CHECKLIST

☐ 1. Inspect the host adapter package (subsection 3.4).

☐ 2. Verify and modify host adapter switch and jumper settings (subsection 3.6).

☐ 3. Fill in the Configuration Record Sheet (subsection 3.5).

☐ 4. *For the QFS10-III:* physically install the QFS10-III in the MicroVAX III backplane (subsection 3.7).
For the QFS10: Install the QFS10, transition panel and cables in a MicroVAX II host system (subsection 3.8).

☐ 5. *Optional:* refer to the guidelines for multi-host installation if you are installing adapters in two or more host systems with shared peripherals (subsection 2.2).

☐ 6. Install the terminator module on the last SCSI Device (subsection 3.9).

NOTE: If both ends of the SCSI bus contain a QFS10 then the active terminator on each QFS10 must be enabled.

☐ 7. Run the power-up self-test and monitor the resulting LED display (subsection 3.10).

☐ 8. Load and start the Firmware-Resident Utilities (FRU) using the appropriate procedure for your system (Section 4).

☐ 9. Configure the host adapter and SCSI devices using the FRU (Section 5).

3.4 Inspection

Emulex products are shipped in special containers designed to provide full protection under normal transit conditions. Immediately upon receipt, inspect the shipping container for evidence of possible damage incurred in transit. Any obvious damage to the container, or indications of actual or probable equipment damage, should be reported to the carrier company in accordance with instructions on the form included in the container.

Unpack the QFS10 and, using the shipping invoice, verify that all equipment is present. Be sure that model or part numbers (P/N), revision levels, and serial numbers agree with those on the shipping invoice. If evidence of physical damage or identity mismatch is found, notify an Emulex representative immediately. If the equipment must be returned to Emulex, it should be shipped in the original container.

Visually inspect the host adapter after unpacking. Check for such items as bent or broken connector pins, damaged components, or any other evidence of physical damage. Examine all socketed components carefully to ensure that they are properly seated.

3.5 Configuration Sheet

When installing the host adapter, be sure to record the subsystem configuration and environment on the Configuration Sheet in Figures 3–1 and 3–2. This information will be helpful to an Emulex service representative should your subsystem require service.

QFS10 CONFIGURATION SHEET

HOST SYSTEM (check system type and list specific model):

___ µVAX II ______________ ___ LSI–II ______________

Operating System:

___ VMS ___ Ultrix other: ______________ Version ______________

SCSI Peripherals: ______________

______________ ______________ ______________

______________ ______________ ______________

QFS10 Assembly (see figure for location of items):

Warranty expires _____ /_____ /_____ Assembly No. ______________

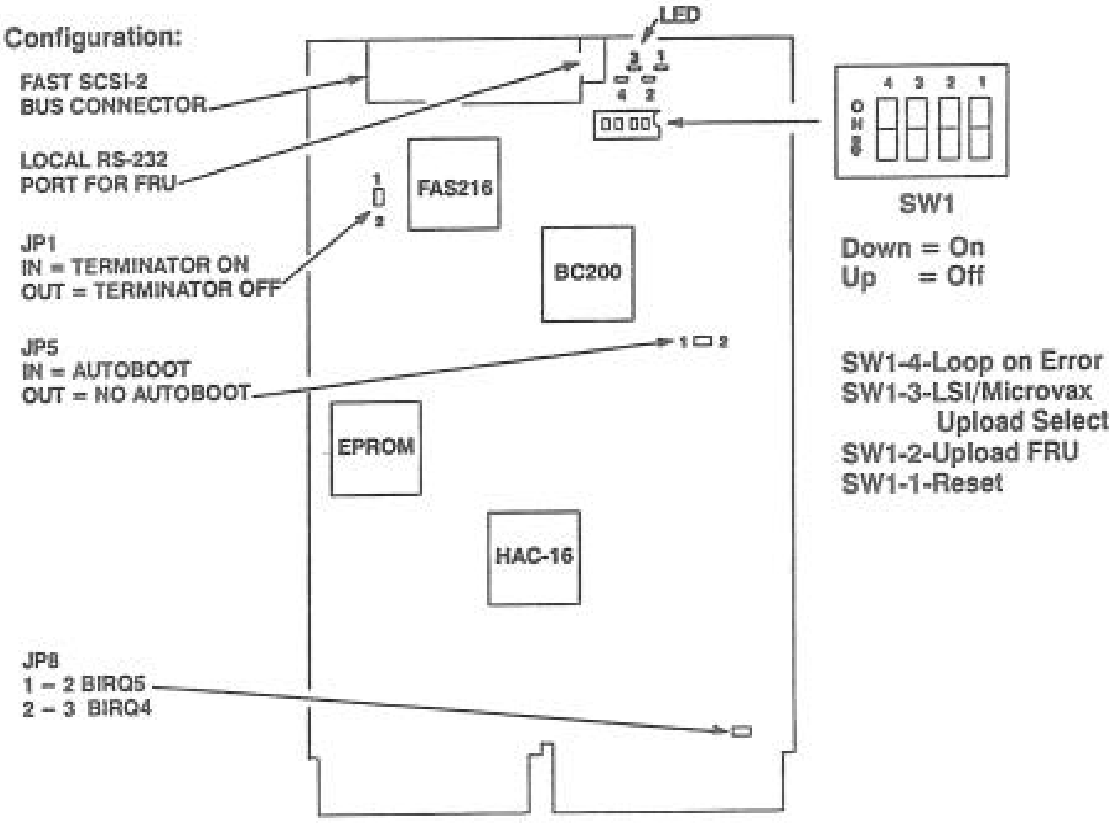
Serial No. ______________ Revision _______ (solder side of board)

Firmware Rev. ______________

Q-Bus Addresses (Used by QFS10): ______________ ______________ ______________

______________ ______________ ______________ ______________

QFS10 Configuration:



QFS10-12

Figure 3–1. Host Adapter Configuration Sheet

QFS10–III CONFIGURATION SHEET

HOST SYSTEM (check system type and list specific model):

___ µVAX III ______________ ___ VAX 4000____________

Operating System: ___ VMS ___ Ultrix other ________________ version ______

SCSI Peripherals: ____________________

____________________ ____________________ ____________________

____________________ ____________________ ____________________

QFS-10/M Assembly (see figure for location of items):

Warranty expires ______ /______ /______ Assembly No. ____________________

Serial No. ________________ Revision _______ (solder side of board)

Firmware Rev. ____________

Q-Bus Addresses (Used by QFS10/M): ____________ ____________ ____________

____________ ____________ ____________ ____________

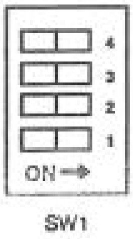
QFS-10/M Configuration:

JP1
IN = TERMINATOR ON
OUT = TERMINATOR OFF

JP5
IN = AUTOBOOT
OUT = NO AUTOBOOT

JP8
1 – 2 BIRQ5
2 – 3 BIRQ4

Right = On
Left = Off



SW1-4 Loop On Error
SW1-3 LSI/MicroVAX Upload Select
SW1-2 Upload FRU
SW1-1 Reset

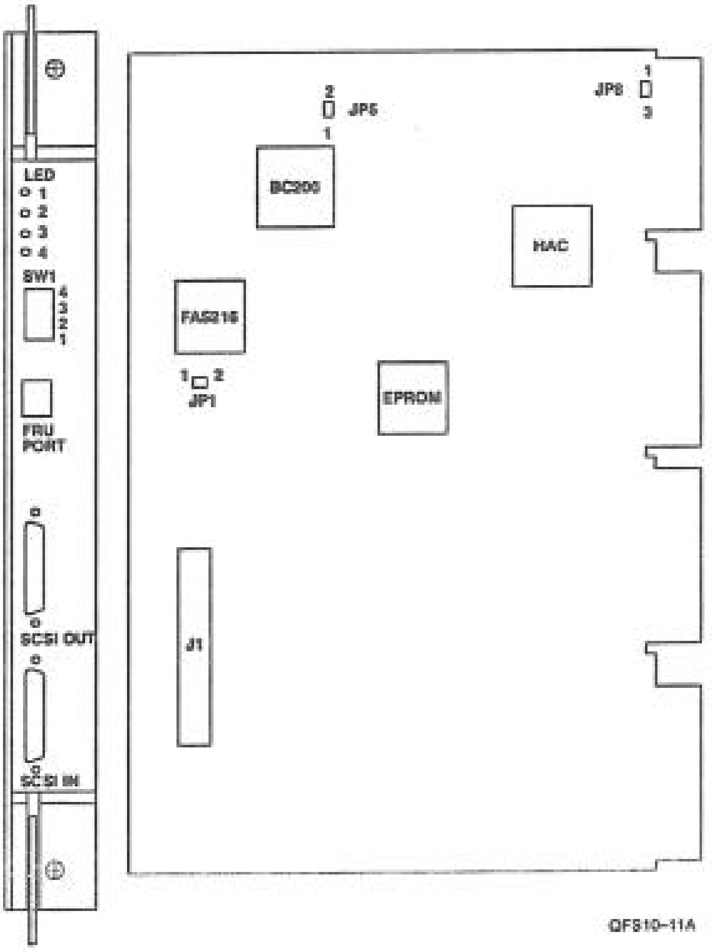


Figure 3–2. QFS10-III Physical Layouts

3.6 Configuring the Host Adapter

This subsection describes how to set the jumpers and switches on the host adapter for maximum performance from your SCSI subsystem. Refer to subsection 3.5 for the location of the jumpers and switches on each board. Detailed descriptions for each switch and jumper follow the summary of default settings below.

NOTE: If you change a switch position on the host adapter, the host adapter must be reset so that its initialization sequence reads the new codes established by the switch settings. To reset the host adapter, either toggle switch SW1-1 (ON then OFF) or cycle power to the system.

Table 3–1 defines the functions and factory configuration of the DIP switch. The switch and jumper definitions are identical for all models.

Table 3–1. Host Adapter Switch Definitions

Switch Position	Description	OFF (0) (Open)	ON (1) (Closed)	Factory Setting
SW1–1	Run-Reset/Halt	Run	Reset/Halt	OFF (0)
SW1–2	Upload FRU Driver	Disable	Enable	OFF (0)
SW1–3	LSI-11/MicroVAX Upload	MicroVAX	LSI-11	OFF (0)
SW1–4	Loop on Self-Test	Normal	Loop	OFF (0)

Table 3–2 defines the functions and factory configuration of the jumpers.

CAUTION! Do not change the settings of the jumpers that have an "*" in the description. If these jumper settings are altered, the QFS10 will not function correctly.

Table 3–2. QFS10 Jumper Configurations

Jumper	Description	Factory Setting
JP1	Termination power to the SCSI bus	IN
JP2	25 Mhz Clk *	IN
JP3	Debug interrupt level *	All OUT
JP4	40 Mhz Clk *	IN
JP5	Autoboot enable	Open
JP6	3.6 Mhz Clk *	IN
JP7	Factory burn in test *	OUT
JP8	Interrupt Request (IRQ) level	Pins 2–3 (Level 4)
* Reserved jumpers – do not change from factory configuration		

3.6.1 Run or Reset/Halt (SW1-1)

Switch SW1-1 allows you to reset and halt the operation of the host adapter by toggling the switch from OFF to ON and back. If the switch is in the ON position operation of the host adapter is halted. The default setting for this switch is OFF (0).

CAUTION! Before you toggle switch SW1-1, shut down the operating system. Resetting the controller with the operating system running is likely to cause a system crash. This may require that the CPU be powered down and up again.

SW1–1 is toggled to halt or reset the host adapter under the following situations:

- If you change any of the other switch settings on the host adapter, or if you change some of the NOVRAM configuration values using the FRU.
- If you receive a hardware error code during testing, reset the host adapter in order to rerun this section of the diagnostic test.

3.6.2 Upload Firmware-Resident Utilities (FRU) Driver (SW1-2)

This switch is used to upload the FRU driver to system memory when you want to change the Q-bus address and a conflict exists between the QFS10 and another Q-bus device. The default setting is disabled (OFF).

When using this switch, you must first enable system memory. After enabling system memory, you can upload the FRU driver by setting switch SW1-2 to ON and resetting the QFS10. Before you exit from the FRU, you must set switch SW1–2 back to OFF.

You may run the FRU from the system console with switch SW1-2 set to OFF if both of the following conditions are met:

- You are using the offline console startup procedure; refer to subsection 4.3.1 (MicroVAX) for information on the alternate system console startup.
- You have already defined the Q-bus base I/O address for the host adapter via host system console commands (see subsection 4.4.1).

3.6.3 Upload Processor Select (SW1-3)

This switch selects either the LSI-11 or MicroVAX family processors for uploading. The default setting is off (MicroVAX selected). This switch works in conjunction with SW1–2 to define which FRU driver code (LSI-11 or VAX) will be uploaded.

3.6.4 Loop on Self-Test Enable/Disable (SW1-4)

The self-test loop option allows you to repeat the self-test for purposes of exercising the controller for extended periods of time. Looping causes the front panel LEDs to continuously display the error messages.

The default setting, OFF, disables looping. Set this switch to ON to enable looping.

NOTE: The loop on error switch (ON) causes extended memory and host adapter chip tests to be performed. These tests can take up to 10 minutes to execute.

3.6.5 Interrupt Priority Level, JP8

Jumper block JP8 determines the interrupt request level (IRQ) for the host adapter. The factory setting is IRQ4 (BR4). This configuration is preferred for most DEC Q-bus systems.

If you use IRQ5 (BR5), Emulex recommends that the host adapter be located behind all DEC devices on the bus. Figure 3–3 illustrates the settings for JP8.

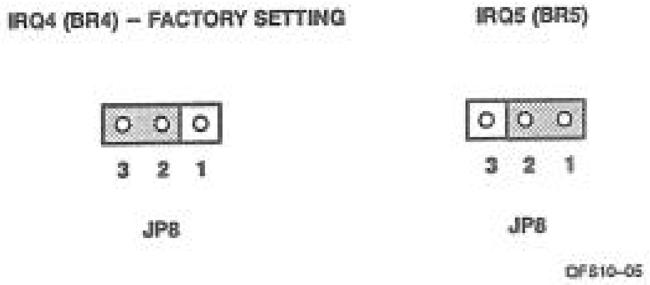


Figure 3–3. Interrupt Priority Level—JP8 Jumper Settings

3.6.6 Active Terminator Enable (JP1)

Jumper block JP1 determines whether or not the QFS10 will provide termination on the SCSI bus. If the jumper is installed (factory configuration) termination is enabled. Removing the jumper disables the QFS10 from providing termination. Figure 3–4 illustrates the two jumper settings.

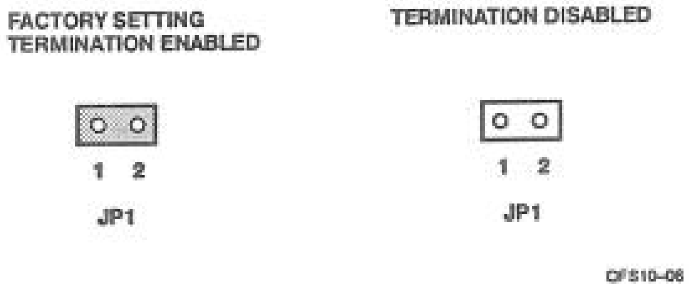


Figure 3–4. SCSI Bus Termination Enabled—JP1 Jumper Settings

NOTE: The QFS10 always supplies termination power through a diode and polyfuse to the SCSI bus.

Emulex recommends the use of keyed connectors. This will prevent accidental grounding or incorrect connections to termination power. The termination power on the QFS10 has the following characteristics:

- 4.25 volts DC to 5.25 volts DC
- Self-resetting circuit that is protected at 1.5 ampere (location F1)
- Diode to prevent backflow of power into the QFS10

3.7 Installing the QFS10-III in a MicroVAX III/VAX 4000 (Separate-Cabinet)

This subsection describes the installation of the QFS10-III in a MicroVAX III host CPU cabinet and the connections to a separate expansion cabinet that house the SCSI peripherals.

3.7.1 Installing the Host Adapter

Use the following procedure to install the QFS10-III in the MicroVAX III host backplane. The QFS10-III includes a front panel with extractor handles.

WARNING!! Observe proper antistatic grounding procedures and use a grounding wrist strap. Remove power from the equipment before removing covers to avoid personal injury and damage to the equipment.

1. Power down the system by switching the main power OFF.
2. Open the front chassis door.
3. Select a slot for the QFS10-III. The only requirement is that slots between the CPU and QFS10-III must be occupied by either active modules or Bus Grant cards.
4. Remove the cover from the slot that will house the host adapter.
5. The board should have its components oriented in the same direction as the CPU and other modules. Slide the board into the slot with the extractor handles in the open position (aligned with the front panel of the PCBA). See Figure 3–5.
6. When the board is properly positioned in the throat of the bus connectors, seat the board by pushing the extractor handles toward the center of the front panel.
7. Use a Philip-head screwdriver to push and turn the handle-locking screws a quarter-turn to lock the QFS10-III into the chassis.

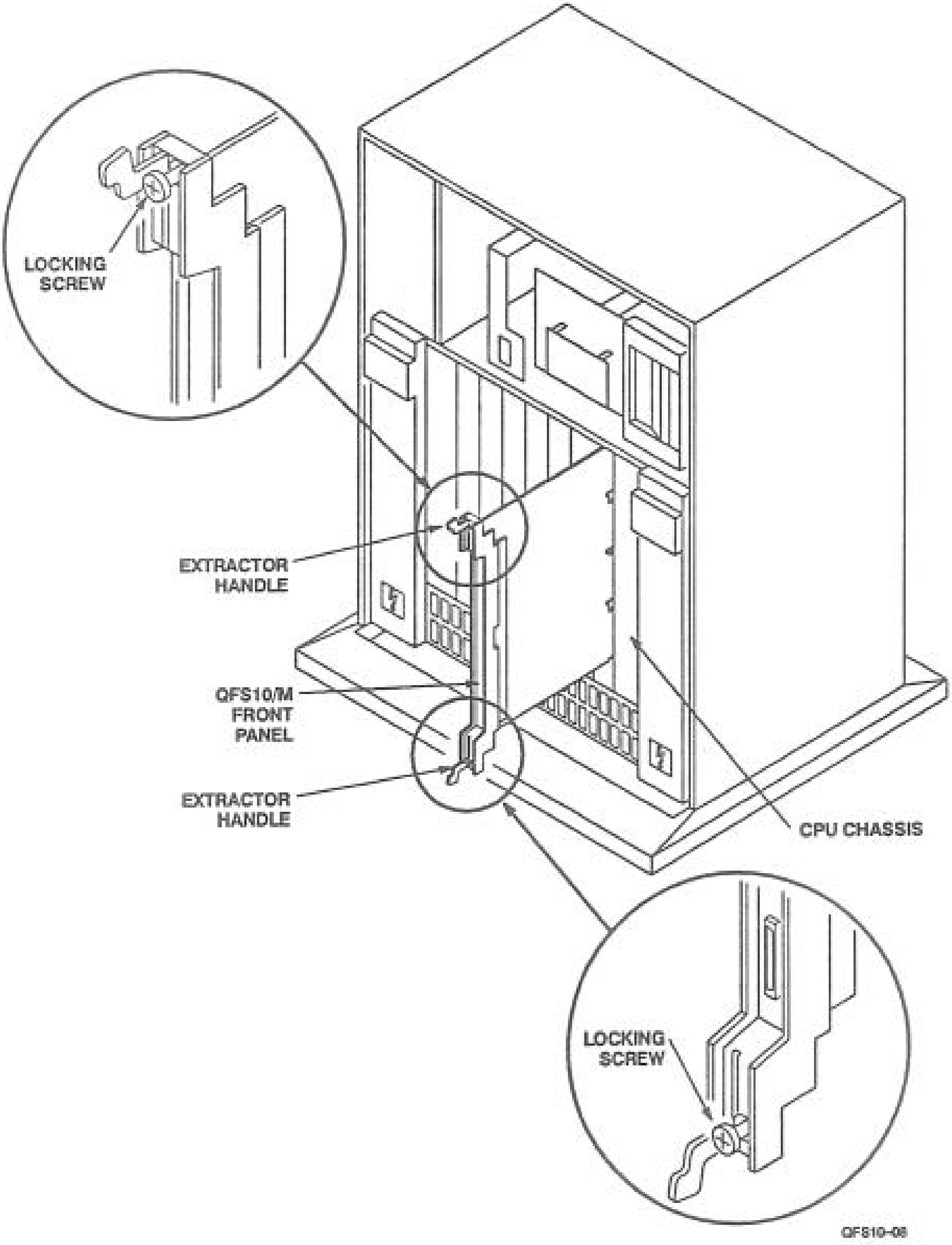


Figure 3–5. QFS10-III in Micro VAX III/VAX 4000

3.7.2 Installing Cabling

The QFS10-III is connected to SCSI devices using a standard 50-conductor shielded cable. Attach the cable from connector J1 on the QFS10-III to the SCSI connector on the SCSI peripheral, observing proper cable orientation. The total cable length (internal and external) must not exceed 19.5 feet (6 meters).

Cabling must not compromise the system cabinet's FCC shielding, causing the computer installation to exceed FCC limits for RFI.

Install the SCSI peripherals according to the manufacturer's instructions. Position the subsystems in their final locations before installing the QFS10-III. This will enable you to correctly estimate the I/O cable length and routing.

In addition to the cable between the host adapter and expansion cabinet, a terminator module must be installed on the last physical SCSI peripheral on a daisy-chain within the expansion cabinet.

3.8 Installing the QFS10 in a MicroVAX II or LSI-11 (BA123)

This subsection describes how to install the QFS10 host adapter in a MicroVAX II or LSI-11 host system, as well as how to attach cabling to the host adapter and the SCSI peripherals.

3.8.1 Installing the Host Adapter

Use the following procedure to prepare the MicroVAX II or LSI-11 host system. Physically install the QFS10 in the host backplane, and cable the QFS10 to the front of the host transition panel.

WARNING!! Observe proper antistatic grounding procedures and use a grounding wrist strap. Remove power from the equipment before removing covers to avoid personal injury and damage to the equipment.

1. Power down the system by switching the main AC breaker OFF.
2. Remove the rear I/O distribution panel from the chassis so that the card cage is exposed. The rear I/O distribution panel is secured by two screws.
3. Select a slot in the card cage for the QFS10. The QFS10 may be installed in any desired slot. However, slots between the CPU and the QFS10 must be occupied by either active modules or Bus Grant cards.
4. Plug the host adapter into the backplane slot. The QFS10 host adapter should be plugged into the Q-bus backplane with components oriented in the same direction as the CPU and other modules. Be sure that the board is properly positioned in the throat of the board guides before attempting to seat the board by pressing it into place.
5. Attach the ribbon cable to the transition panel at the back of the system cabinet. Use the screws that hold the cover plate to install the transition panel.
6. Attach the 3–pin FRU connector to the 3–pin plug receptacle located next to the SCSI 50–pin connector.

3.8.2 Installing the Host Adapter, Multi–Host Environment

1. Follow steps 1–4 in section 3.8.1.
2. Unscrew the dummy plate from the second hole in the transition panel.
3. Insert the optional QS1010404 I/O board into the second hole and tighten the high density screws.
4. Attach the **end** of the 50–pin ribbon cable to the QS1010404 assembly.
5. Attach the **middle** of the 50–pin ribbon cable to the QFS10 controller.
6. Attach the 3–pin FRU connector to the 3–pin plug receptacle located next to the SCSI 50–pin connector.

3.8.3 Installing Cables to the SCSI Peripherals

Install the SCSI peripherals according to the manufacturer's instructions. Position the subsystems before cabling the QFS10. This positioning allows the I/O cable routing and length to be accurately judged.

The QFS10 is connected to SCSI peripherals using a standard 50-conductor round-shielded cable. Attach the cable from the transition panel to the SCSI connector on the SCSI peripheral, observing proper cable orientation. The total cable length (internal and external) must not exceed 19.5 feet (6 meters).

3.9 Termination (All Host Systems)

SCSI buses are terminated at each end. The QFS10 provides termination for one end of the cable. The other end must have a terminator. However, peripheral controllers daisy-chained between the QFS10 and the opposite end of the SCSI bus must have their terminators removed. See the controller or subsystem manufacturer's documentation for instructions on installing or removing terminators.

NOTE: If the QFS10 is not at the end of the SCSI bus, remove jumper JP1 to disable its onboard active terminator. The QFS10 supplies terminator power to the SCSI bus at all times. The voltage is diode isolated and protected with a 1-Amp auto-resettable fuse. There is no way to disable the QFS10 from supplying terminator power to the SCSI bus.